

PREPRODUCTION INITIATIVE-NELP AVIATION FUEL RECLAMATION SYSTEM TEST PLAN

SITE: NAS NORTH ISLAND

1.0 OBJECTIVE

This test plan describes the data collection procedures for testing the Aviation Fuel Reclamation System. The data will be used to determine the efficiency, effectiveness, and overall success of the unit and the associated procedures. Specifically, the test plan will:

- Demonstrate that the recycled fuel meets the specifications for JP-5 aircraft fueling
- Evaluate the system's ability to interface with existing fuel farm operations and equipment
- Analyze the long-term cost savings and environmental benefits of minimizing JP-5 waste
- Evaluate equipment reliability, maintainability, and supportability.

In summary, this test plan will demonstrate the success of the fuel recycling procedure and the ability of the equipment to perform in accordance with relevant specifications for fuel quality.

1.1 Reference Documents

- Operating and Maintenance Manual F-111, Special Fuel Reclaim Filtration System (Filterdyne Filtration Systems, Inc.)
- Fuel Recycler Operational Procedures (NAWC Lakehurst document)
- Squadron Standard Operating Procedure for the Collection of Reclaimable JP-5 (Message Ser18E/234 dated 15 May 1996 from NASNI SCE)
- NAVAIR 00-80T-109, Aircraft Refueling NATOPS Manual
- MIL-T-5624, Turbine Fuel, Aviation Grades JP-4 and JP-5
- MIL-HDBK-200G, Quality Surveillance Handbook for Fuels, Lubricants, and Related Products
- MIL-HDBK-844(AS), Aircraft Refueling Handbook

2.0 DESCRIPTION

The Aviation Fuel Reclamation System will be used to recycle JP-5 aviation fuel samples (that are collected and segregated by the squadron) for reuse in aircraft or other aircraft applications. The majority of these samples are from daily preflight checks performed on each aircraft scheduled for flight. One quart JP-5 samples are drawn from the aircraft fuel tanks to ensure fuel quality. Previously, handling procedures at NAS North Island (NASNI) dictated that JP-5 samples and other lower grade waste oils be disposed of through the DRMO. A new squadron segregation SOP (Message Ser18E/234) was released by NASNI SCE in May 1996 in conjunction with the NAWCADLKE NELP fuel recycler test program. Through careful segregation of the JP-5 samples and the use of a filter/separator system (such as the prototype Aviation Fuel Reclamation System), this type of waste can be minimized and the fuel reused for its originally intended purpose.

To ensure safety, the recycled fuel must meet all pertinent fuel quality specifications before reuse in aircraft. This test plan will verify that the recycled JP-5 fuel quality conforms with these specifications. Comments about the ability of the system to interface effectively with current Navy procedures and operations will also be logged. In addition, the quantity of reusable fuel produced will be documented to demonstrate the long-term cost savings and associated environmental benefits of fuel recycling as a form of waste minimization.

2.1 Prerequisites for Operation

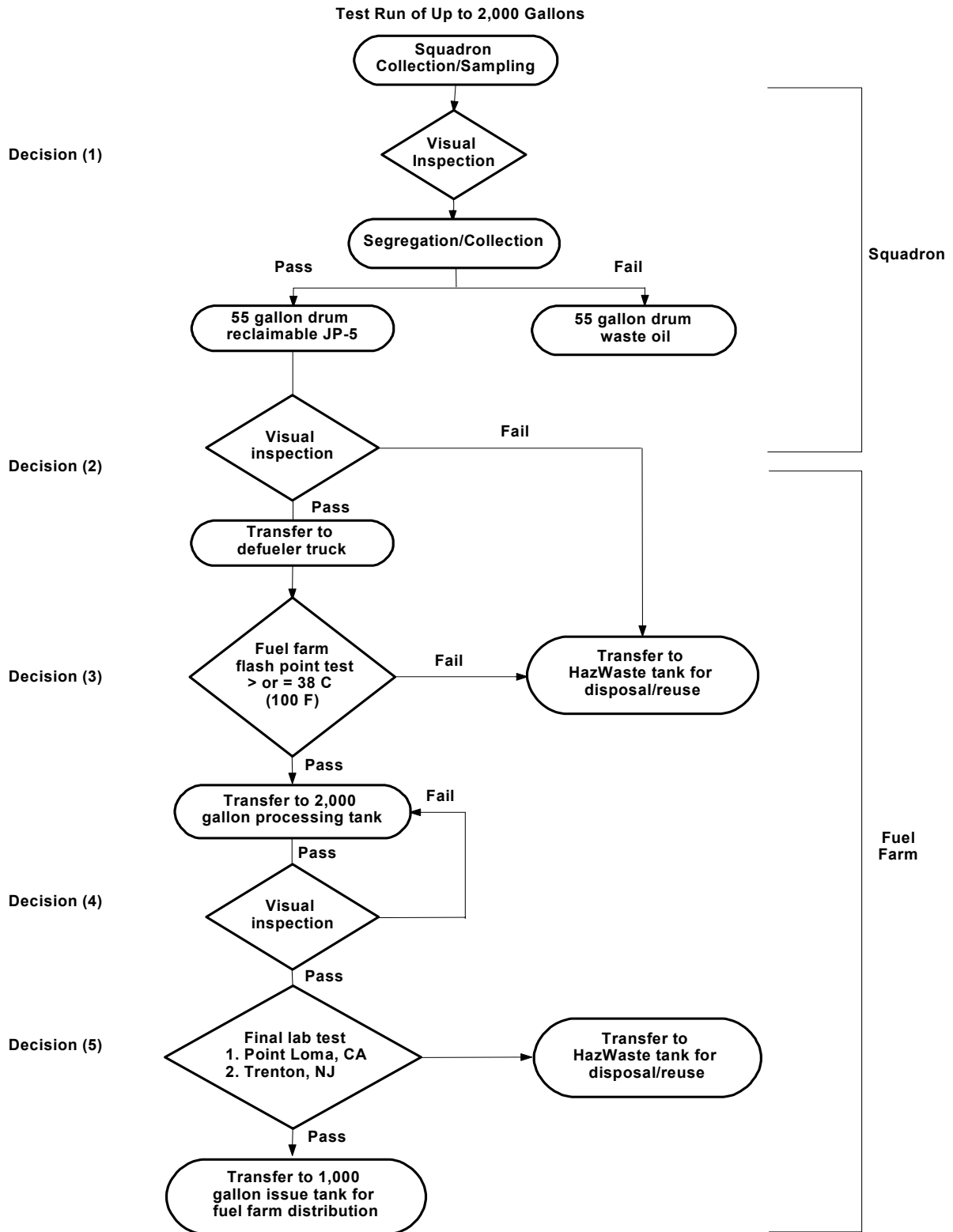
Each squadron must adhere to the Fuel Segregation SOP (Message Ser18E/234) and designate one or more locking collection drums labeled "Reclaimable JP-5."

2.2 Fuel Recycling Test Procedure and Quality Assurance

The following section describes individual procedures and the necessary interface among the squadrons, fuel farm, and quality assurance testing laboratories. Figure 1 illustrates this process.

2.2.1 Squadron Collection and Accountability

Each NASNI squadron has access to a regulated hazardous material (HazMat) storage area. Current procedures for handling HazMat mandate that different types of waste be segregated. As a result of preflight sampling or pencil draining, waste JP-5 fuel will continue to be segregated in this manner. However, it will be emphasized that squadron personnel are responsible for safety and quality assurance in the segregation/recycling process. As described in the above-referenced squadron collection and segregation SOP, only JP-5 fuel can be placed in the collection drums designated "Reclaimable JP-5." No other products will be commingled with the JP-5 fuel. Acceptable JP-5 fuel will contain no contaminants other than particulates or water.



Note: Samples will be drawn for the 2,000 gallon tank before circulation begins for analysis by Point Loma and Trenton as a means of comparison with the recycled product.

Figure 1. Fuel Recycling Procedure Flow Diagram

JP-5 fuel that is suspected of containing any other form of contamination (*e.g.*, dye, gross contamination, suspect contamination due to aircraft engine problems) will not be accepted or collected for recycling. Detachments that share the HazMat storage area of a host squadron will also comply with the fuel collection and segregation SOP.

Each squadron is accountable for the fuel it collects. Fuel samples and pencil drainings will be accepted or rejected based on water and particulate content, appearance, or suspicion of contamination. Before being placed in the reclaimable JP-5 drum, it is suggested that acceptable samples be logged in a ledger book by date, quantity, and responsible person. Unacceptable samples will also be logged by date, quantity, responsible person, and the reason for unacceptability. Unacceptable samples will be disposed of through previously established methods (*i.e.*, the fuel farm waste oil truck will continue to pick up all squadron waste petroleum products).

Squadron personnel will be apprised of the following key criteria.

- **Acceptable Fuel:** Fuel that is clear, bright, and not suspected of contamination other than particulates and water will be collected in the reclaimable JP-5 drum.
- **Unacceptable Fuel:** Fuel that appears to be grossly contaminated, contains dyes, or is suspected of contamination will be collected in the waste oil/recyclable oils drum.

2.2.2 Fuel Farm Approval and Pick-Up

When a reclaimable JP-5 drum is almost full, squadron personnel responsible for the HazMat storage area will notify the fuel farm. The fuel farm will schedule the defueler truck that is designated for reclaimable JP-5 collection to pick up the fuel for recycling. The designated defueler will make regular rounds of the squadron HazMat collection areas to defuel the reclaimable JP-5 drums.

Fuel farm personnel will visually inspect a sample of the contents of the drums before defueling. Such samples will be visually inspected to ensure that the fuel in the drum:

- appears clear and bright
- is free of gross particulate or water contamination.

If the fuel sample fails any of these criteria, the fuel farm will dispose of the entire contents of the drum as waste oil. (The waste oil truck will be dispatched as soon as possible to remove the unacceptable fuel. To prevent contamination, the designated reclaimable JP-5 defueler will not be used to remove unacceptable JP-5.) Fuel that meets the criteria will be defueled by fuel farm personnel into the designated reclaimable JP-5 defueler truck.

2.2.3 Fuel Farm Operation of Recycling System

The reclaimable JP-5 defueler truck will complete its squadron collection schedule and defuel into the 2,000 gallon processing tank. Before defueling into the tank, a sample of fuel will be tested in the fuel farm laboratory to ensure that the flash point is greater than or equal to 38°C (100°F). If the flash point *is not* acceptable, the fuel will be defueled into the fuel farm hazardous waste (waste oil) tank located adjacent to the Fuel Recycler Unit. If the flash point *is* acceptable, the fuel will be defueled into the Fuel Recycler's 2,000 gallon processing tank.

NOTE: A minimum acceptable flash point of 38°C allows for the reclamation of fuel that is a mixture of JP-5 and JP-8/JetA. This maximizes the amount of potentially reclaimable fuel.

Each time the JP-5 defueler truck defuels into the processing tank, a 1 gallon sample will be drawn from the first sample port located before the filter/dehydrator vessel. The sample will be labeled "Dirty" and include the date and assigned batch number. The sample should be stored safely until the current batch of fuel has been recycled.

During the test period, one batch of fuel shall equal approximately 1,000 gallons. Upon accumulating one batch of fuel in the processing tank, the system will be activated and the fuel will be cycled continuously through the filter/separator system. The number of cycles will depend on the relative cleanliness of the fuel. After one complete pass (cycle) of fuel through the system, use the sample port near valve V4 to draw a sample of fuel. (One complete pass requires approximately 67 minutes if 1,000 gallons of fuel are in the processing tank. See Fuel Recycler Operating Procedures for further guidance.) Visually inspect the sample. If particulate or water contamination is still apparent, an additional cycle through the filter/separator will be required. Examine another sample at the completion of this additional cycle. Repeat this process until the fuel passes the visual exam. It is anticipated that each batch of fuel will require only one pass through the system in order to meet specifications.

After passing the visual exam, duplicate 1 gallon samples will be sent to the fuel testing laboratories at Point Loma, CA, and NAWCAD in Trenton, NJ. The samples will be labeled "Clean" and include the date and batch number. All "Dirty" samples with corresponding batch numbers will be sent to NAWCAD Trenton at this time as well. (It is not necessary to send "Dirty" samples to Point Loma.)

WARNING: The recycled batch of fuel shall **not** be transferred to the 1,000 gallon issue tank until acceptable results are received from both laboratories.

2.2.3.1 Method of Shipping Samples to Laboratories

Samples shall be shipped using standard red shipping containers and 1 quart glass bottles. For a complete sampling kit, use NSN 8115-00-719-4111.

Samples shall be shipped by the most expeditious means. When shipping samples to NAWCAD Trenton, the use of Federal Express Government Services is encouraged. It is

recommended that “Dirty” and “Clean” samples from each batch be shipped as matched pairs to facilitate evaluation of the recycling unit’s efficiency. For example, if the defueler truck defueled into the processing tank twice to create a batch of approximately 1,000 gallons, then NAWC Trenton should receive two “Dirty” samples (one “Dirty” sample from each time the truck defueled into the system) and one “Clean” sample (after the fuel has been cleaned by the system) for a total of three samples that all correspond to the same batch number. Identical clean samples from the same sources would be sent to Point Loma.

Samples will be delivered to Point Loma in person as per normal QA operating procedures.

2.2.4 Results of Laboratory Analysis

The Point Loma and NAWCAD Trenton laboratories will perform limited specification testing of the fuel samples received. The tests performed will be those specified in MIL-HDBK-200G for B-1 testing of JP-5. If the results of the B-1 tests meet *all* of the use limits specified in Appendix B of NAVAIR 00-80T-109 (except that the minimum acceptable flash point shall be 38°C), the fuel will be declared suitable for aircraft use.

Results of the fuel testing will be provided via fax to NASNI fuel farm within 5 working days of receipt of fuel samples. If complete results cannot be provided within this time frame for any reason, partial results (annotated with the date and time final results are expected and the reason for delay) will be provided. Results will be reported using the attached Laboratory Analysis Data Form. The NASNI fax number is (619) 545-8838, Attn: G. Cook. A duplicate copy of the results should also be faxed to (609) 667-7586, Attn: K. Stallone, for inclusion in the final study.

If both laboratory analyses agree that the fuel is acceptable for aircraft use, the fuel farm will transfer the entire batch of fuel to the 1,000 gallon issue tank for distribution (*e.g.*, for aircraft, SE, or other uses). If either laboratory concludes that the fuel is unacceptable for aircraft or other usage, the entire batch of fuel will be transferred to the waste oil (hazardous waste) tank.

3.0 TEST PLAN

This test plan will be used to evaluate the effectiveness of the Aviation Fuel Reclamation System. Emphasis will be placed on the system’s ability to produce recycled JP-5 fuel suitable for aircraft use as well as the successful integration of the fuel recycling process.

3.1 Approach

Quantitative and qualitative data will be acquired by completion of the following attached forms:

- Fuel Farm Defuel Data
- Fuel Farm JP-5 Recycling Operations Data
- Laboratory Analysis Data
- Fuel Farm Assessment of Equipment Performance, Reliability, Maintainability, and Supportability

3.1.1 Instructions for Completing Fuel Farm Defuel Data Form

The Fuel Farm Defuel Data form will be used by fuel farm personnel responsible for defueling the reclaimable JP-5 drums. *Copies of this form must be submitted monthly.* Fuel farm personnel will enter the following:

- **Defuel Date**
- **Squadron Identifier**
- **Approximate Quantity Defueled (Gallons)**

3.1.2 Instructions for Completing Fuel Farm JP-5 Recycling Operations Data Form

For *each* batch of fuel that is recycled through the filter/separator system, fuel farm personnel will complete a Fuel Farm JP-5 Recycling Operations Data form. *This form must be submitted each time a batch of fuel has either been certified for reuse or transferred to the hazardous waste tank.* A batch will equal approximately 1,000 gallons of fuel. Information must be entered on the form each time the reclaimable JP-5 defueler truck defuels into the 2,000 gallon tank to create a complete batch of fuel. This information will include:

- **Batch Number:** Assign a consecutive number to each batch processed.
- **Date:** Indicate date of defueling.
- **Flash Point:** Indicate results of fuel farm flash point test for each truckload of fuel.
- **Quantity Defueled into 2,000 Gallon Tank:** Enter quantity or “0” if the results of the flash point test are unacceptable.
- **Quantity Defueled into HazWaste Tank:** Enter “0” if the results of the flash point test are acceptable or enter quantity if the flash point was unacceptable.

- **Total Number of Cycles Required to Pass Visual Exam:** When the quantity of fuel stored in the 2,000 gallon tank equals a batch, the fuel will be cycled through the filter/separator system until it appears to be free of particulates and water. At this point, fuel farm personnel will record the number of cycles the fuel circulated through the system. The length of time the unit was in operation should also be included whenever possible.
- **Quantity/Date Transferred to 1,000 Gallon Issue Tank or to Hazardous Waste Tank:** Record which tank the recycled fuel was transferred to (*i.e.*, the issue tank or the adjacent hazardous waste tank) and the quantity. Choice of tank shall be determined by the results of Point Loma and NAWCAD Trenton laboratory testing.
- **Ultimate Use of Batch:** Enter this data (*i.e.*, aircraft, SE, waste, other) if known.

3.1.3 Instructions for Completing Laboratory Analysis Data Form

The responsible personnel at each laboratory (Point Loma and NAWCAD Trenton) will report the results of the pre-recycled (“Dirty”) and recycled (“Clean”) fuel sample testing on the Laboratory Data Analysis Form. ***This form must be submitted each time a batch of fuel is analyzed.*** The form is self-explanatory, and all blocks must be completed.

NAWC Trenton will establish the reuse options for the fuel based on the lab results.

3.1.4 Instructions for Completing the Fuel Farm Assessment of Equipment Performance, Reliability, Maintainability, and Supportability Form

The Fuel Farm Assessment of Equipment Performance, Reliability, Maintainability, and Supportability form will be used to assess the fuel recycling system as follows. ***This form must be submitted monthly.***

- **Operational Time:** Using the calendar, *circle* which days of the month the filter/separator system was in operation (*i.e.*, a full batch of fuel was circulating through the system).
- **Downtime:** Using the calendar, block off periods of equipment downtime. Explain whether the downtime was due to repairs, standard maintenance, awaiting accumulation of full batch of fuel, or awaiting lab test results. Also, record estimates of labor time to:
 - Perform standard maintenance tasks on the system
 - Operate and monitor the system/controls
 - Perform fuel quality sampling and testing tasks.

- **Repair Parts and Consumables Ordered:** Enter the date that repair parts or consumables (such as filter/separator elements) were ordered and the quantity and cost.
- **Qualitative Assessment:** Evaluate the general success of the fuel recycling method. Briefly address the following:
 - Efficiency of the system (time and cost savings)
 - Ease of use and the system's ability to successfully interface with existing site operations. State any problems or special benefits created by the unit. Comment on how labor-intensive the system is.
 - Overall satisfaction with the equipment and the recycled fuel product
 - Suggestions for improving the system or resolving any problems.

4.0 REPORTING

The data entry forms are a concise method of data collection. Forms should be completed on a daily basis. Data will be collected for 1 year. During this time, periodic status reports on the testing will be submitted to NAWCADLKE. The final report will include detailed results and observations, assess the efficiency and cost-effectiveness of the unit, and evaluate its ability to interface with site operations.

**FUEL FARM DEFUEL DATA FORM
(RECLAIMABLE JP-5 ONLY)**

Submit Form Monthly.

Defuel Date	Squadron Name	Approximate Quantity Defueled (Gallons)*	Responsible Person

Comments:

* Submit one form for each batch of fuel that has been transferred either to the 1,000 gallon tank (certified for reuse) or to the HazWaste Tank.

**FUEL FARM JP-5 RECYCLING OPERATIONS DATA FORM
(ONE BATCH REPORT PER FORM)**

Batch Number: _____

Date	Flash Point of Sample from Truck	Quantity Defueled into Process Tank	Quantity Defueled into HazWaste Tank

Total # of Cycles and Length of Operational Time Required to Pass Visual Exam: _____

Quantity/Date Transferred to 1,000 Gallon Issue Tank: _____

Quantity/Date Transferred to HazWaste Tank: _____

Ultimate Use (*i.e.*, aircraft, SE, waste, other): _____

* Submit one form for each batch of fuel that has been transferred either to the 1,000 gallon tank (certified for reuse) or to the HazWaste Tank.

**FUEL FARM ASSESSMENT OF EQUIPMENT PERFORMANCE,
RELIABILITY, MAINTAINABILITY, AND SUPPORTABILITY FORM**

Submit Form Monthly.

Indicate Operational and Downtime for the Month of: _____

1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

Repair Parts and Consumables Ordered:

Item	Date Ordered	Quantity	Cost	Date Received

Qualitative Assessment:

Please comment on effectiveness and efficiency of system, provide general comments, and clarify any of the above data.

LABORATORY ANALYSIS DATA FORM

Laboratory Name: _____ **Date of Report:** _____

Responsible Person: _____ **Date Fuel Samples Received:** _____

Batch Number: _____

Test	Use Limit	“Dirty” Results	“Clean” Results
Particulates	2.0 mg/L (maximum)	_____	_____
Free Water	ppm (Report)	_____	_____
Flash Point	38°C (minimum)	_____	_____
Color (Visual)	Report	_____	_____
API Gravity	36.0-48.0	_____	_____
Distillation	Minimum of 7% recovered by 205°C (400°F)	_____	_____
Residue	2% vol/vol (maximum)	_____	_____
Copper Strip	1 (maximum)	_____	_____
Freezing Point	Report	_____	_____
Existent Gum	14 mg/100 ml (maximum)	_____	_____
Water Reaction	Report	_____	_____
FSII	0.03-0.20 vol%	_____	_____
WISM*	Report	_____	_____

Recommended Use for Recycled Fuel: _____
(State reason if not acceptable for use as aviation fuel.)

Comments: _____

*NAWC Trenton only